CALIFORNIA DEPARTMENT OF TRANSPORTATION

Division of New Technology and Research

INTELLIGENT TRANSPORTATION SYSTEMS DEPLOYMENT PLAN STRATEGIC EVALUATION

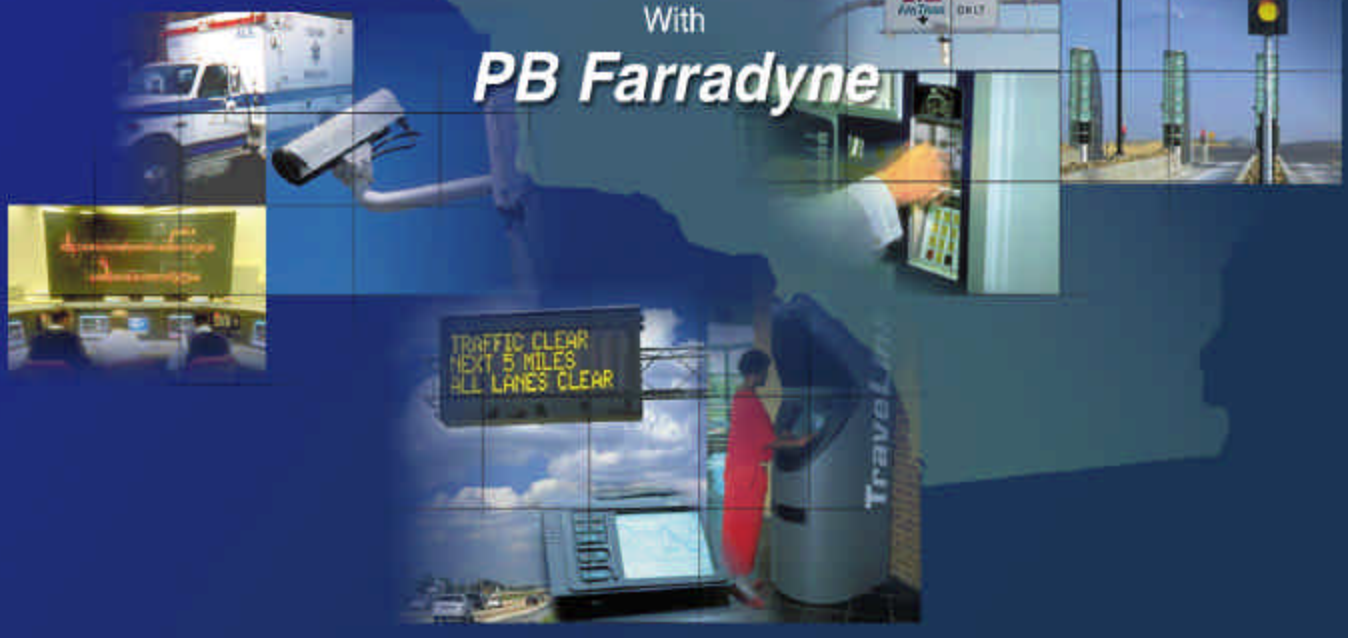
Final Report

June 28, 2002

Franklin Hill Group

With

PB Farradyne



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DISCLAIMER

This report was prepared by the Franklin Hill Group in conjunction with PB Farradyne. It is intended for the sole use of Caltrans Division of New Technology and Research, Office of Deployment Planning. The contents of this report reflect the views of the authors and do not necessarily reflect the views of the State of California or any specific individual interviewed.

ACKNOWLEDGEMENTS

Cheryl Stecher of Franklin Hill Group and Jackie Golob of PB Farradyne would like to thank the many people throughout the state that generously gave of their time to participate in the study interviews.

EXECUTIVE SUMMARY

STUDY PURPOSE

To explore:

- The extent to which existing Intelligent Transportation System (ITS) Early Deployment Plans or Strategic Deployment Plans (EDP/SDPs) in California met federal requirements for consistency with the National ITS Architecture;
- The extent to which ITS projects in current plans had been implemented;
- Barriers (if any) to the implementation of ITS projects locally;
- The extent to which the plans considered connectivity between modes and across regions;
- Next steps (if any) needed to respond to the new federal regulations regarding the regional ITS architecture(s); and,
- Ways in which Caltrans could and should support the planning and implementation of ITS projects across the state.

STUDY METHOD

In each EDP/SDP planning area, the following were conducted:

- An in-person meeting or telephone interview with Caltrans district office staff from both Planning and Traffic Operations;
- An in-person meeting or telephone interview with staff from the lead regional transportation planning agency for the plan area; and,
- Telephone interviews and email follow-up with other key individuals involved in the SDP plan and/or ITS implementation in the region.

In the rural ITS planning areas and the areas not currently covered by an SDP, the team relied primarily on telephone and email interviewing. Over 65 individuals were interviewed.

SUMMARY ORGANIZATION

The report and executive summary are organized around three key findings from the evaluative fieldwork and interviews. Under each key finding are a series of sub-findings, each with an associated recommendation.

During the course of this study, the consultant team identified several recommendations that arose out of the team's observations and further discussions. These recommendations are presented at the end.

KEY FINDINGS AND RECOMMENDATIONS

1. All of California's Intelligent Transportation System (ITS) Strategic Deployment Plans (SDPs) have a framework in place to enable them to be in conformity with the National ITS Architecture regulations by 2005.

SUB-FINDINGS	*RECOMMENDATIONS*
1.1 Other than the detailed findings noted below, there is no need for further ITS SDP development at the local level in California. Developing the plans has proven to be a highly successful process extensively supported by stakeholders.	*1.1 Caltrans New Tech staff should focus their activities on offering training and technical ITS deployment support to both regional transportation planning agency (RTPA) and Caltrans district office staff.*
1.2 The Southern California Showcase architecture, which served as a model for the National ITS Architecture, is not yet sufficiently documented in terms of interface requirements and information exchanges. This particularly affects new projects that need to access the regional network.	*1.2 Caltrans should closely monitor the Southern California response to the need for Showcase architecture documentation as it relates to integration with new projects.*
1.3 Imperial County (one of the six counties in the Southern California Association of Governments region) is not formally part of an ITS SDP area. However, Imperial County has strong ITS potential at its two border crossings.	*1.3 Caltrans should provide technical training and assistance to Imperial County staff to enable them to join an adjacent ITS Plan area.*
1.4 There are a few counties and portions of counties in Northern California that through oversight are not formally part of an ITS Strategic Deployment Plan region. In each of these counties, there does not appear to be sufficient ITS activity, either planned or programmed, to warrant a separate county ITS SDP.	*1.4 Caltrans New Tech staff should assist with the formulation of language that includes the overlooked counties and portions of counties for inclusion in existing SDP updates. The affected RTPAs are:* ➢ *Butte County Association of Governments, Colusa County Transportation Commission, and Glenn County Regional Transportation Commission should be assisted in partnering with either COATS (District 2) or the Sacramento Area ITS SDP;* ➢ *Lake County Council of Governments, Lassen County Transportation Commission, Mendocino County Organization of Governments, Plumas County Transportation Commission, and the Tehama County Transportation Commission should be assisted in including the entire county in COATS (District 2).*
1.5 All of the SDPs reviewed were weak with respect to the operating agreements section (d. 4) of the federal rule. Generic operating agreements are not required by FHWA to be developed in advance, but a listing of anticipated agreements is expected.	*1.5 Caltrans New Tech should identify and gather best practice examples of ITS local partnership agreements, and make these best practice examples available to the Caltrans district offices and local RTPAs as the need arises.*

2. ITS in California has moved from the planning stages to deployment. A key barrier to deployment is funding for ongoing maintenance and operations of ITS elements and projects.	
SUB-FINDINGS	***RECOMMENDATIONS***
2.1 Ongoing funding for maintenance and operations of ITS infrastructure is a major barrier to ITS deployment. Many regional agencies look to their Caltrans district to provide the maintenance and operations of the ITS backbone region-wide.	*2.1.1 Caltrans New Tech should work with Operations and Maintenance staff to assist the deployment of ITS by identifying cost sharing or other mechanisms for providing for the ongoing operations and maintenance of ITS.* *2.1.2 Caltrans should elevate the discussion of the continued operation of Showcase within Caltrans headquarters and encourage the formation of a policy regarding Showcase that would apply to all four local District Offices (7, 8, 11 and 12)*
2.2 The changes in the flow of transportation funding within California has limited the influence Caltrans Headquarters can exert on regional agencies with regard to ITS planning and deployment. The local Caltrans district offices have a much greater role in regional ITS deployment.	*2.2 Caltrans New Tech should monitor successful partnerships between district offices and regional agencies to identify and disseminate lessons learned. Joint funding arrangements and experiences with alternative approaches to leveraging funding for projects of regional importance would be particularly valuable*
2.3 With much of the ITS infrastructure now in place, the focus of ITS planning is shifting in the mature areas to interagency integration. Identifying and filling local gaps, and configuration management of deployed ITS are now the focus.	*2.3 Caltrans should further develop configuration management skills among its staff so as to be able to provide direct support to districts and regional agencies.*
2.4 Another barrier to ITS deployment identified in the interviews was a lack of information about specific costs/benefits of ITS elements. There were two issues: ➢ **A perceived lack of information and,** ➢ **That the information provided was too complex for ready use in project evaluation.**	*2.4.1 Caltrans should explore proactive methods of getting ITS information to district staff – either in person, or as an outreach effort that extends further into the district office staffing hierarchy.* *2.4.2 Caltrans New Tech should translate research findings on ITS costs/benefits into simple factors such as vehicle hours of delay or vehicle hours saved for greater ease of use in project evaluation.*
2.5 Both district and RTPA staff indicated an on-going need for training on ITS technical elements. Rural district and rural RTPA staff suggested that New Tech could assist them by providing staff support with the technical skills to assist with ITS deployment.	*2.5.1 Caltrans staff with technical expertise in ITS should be involved in training programs coordinated by other Caltrans units.* *2.5.2 Caltrans should provide technical and staff support to rural RTPAs and district offices for ITS deployment.*
2.6 Some district and RTPA staff suggested that a key method of supporting the incorporation of ITS elements into Caltrans construction projects would be to include ITS in Caltrans highway construction standards.	*2.6 Caltrans New Tech and Traffic Operations staff should work with staff from the Divisions of Design, Engineering Services and Construction to study the feasibility of including ITS in the highway construction standards. This study should also include opportunities for RTPAs to review and comment on any proposed changes.*

3. ITS is reasonably well-connected at the local levels within California. Most Caltrans district offices provide within-district area connectivity through the Transportation Management Centers (TMCs), and regional planning agencies provide within-county connectivity. Caltrans should focus its ITS planning efforts on interregional connectivity.	
SUB-FINDINGS	***RECOMMENDATIONS***
3.1 Many district and RTPA staff felt that Caltrans should develop a statewide ITS strategic deployment plan to guide interregional connectivity. However, there was little support for a statewide architecture.	*3.1. Caltrans New Tech staff should provide input to the development of a statewide ITS Strategic Deployment Plan to ensure that a statewide plan supplements and supports the efforts of the regional SDPs.*
3.2 Caltrans districts that are within the same TMC region appear to be well connected. There are gaps between adjacent districts that are in different TMC regions; the statewide Transportation Management System (TMS) Master Plan may be addressing these gaps. However, there does not appear to be significant coordination between the statewide TMS Master Plan and the regional ITS SDPs.	*3.2 Caltrans New Tech staff should be the liaison between the ITS Strategic Deployment Plan areas and the Caltrans TMS Master Plan effort.*
3.3 Several persons suggested that there was a need for a single focal point for coordinating and consolidating California's input regarding ITS into the federal transportation reauthorization legislation.	*3.3 Caltrans New Tech should coordinate and consolidate California's response to national and federal ITS initiatives, such as ITS standards development, and input regarding ITS issues in the federal transportation reauthorization legislation (TEA-3).*

CONSULTANT RECOMMENDATIONS
4.1 Develop systems engineering skills among staff so as to be better able to support the district offices and regional planning agencies in project design.
4.2 Review the Caltrans project development process to ensure the process is aligned with the systems engineering approach.
4.3 Conduct a study of the issues and processes surrounding the maintenance, operations and replacement of ITS components, and provide recommendations for streamlining, simplifying and supporting the administrative processes.
4.4 Work with FHWA to clarify the roles and responsibilities of Caltrans and FHWA with regard to ITS planning at the local level.
4.5 Establish and coordinate a statewide committee to create a Commercial Vehicle Operations (CVO) ITS partnership in support of information exchange regarding technology and security issues at borders and ports of entry statewide and across states. Caltrans New Tech could lend staffing support and leadership in forging consensus on CVO ITS architecture issues.

INTRODUCTION

Intelligent Transportation Systems (ITS) have been defined as the application of technology to make smarter use of transportation infrastructure. To encourage the use of ITS, the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) funded the development of Early Deployment Plans (EDP's), now called Strategic Deployment Plans (SDPs). The purpose of these plans was to identify transportation system needs that could be met using ITS strategies, and define ITS projects and their time frames for design and deployment. As of the time of this study, twelve EDP/SDPs had been developed, or were in the process of being developed, within California.

A key component of the SDP is the development of a common regional architecture to guide the design of ITS and ensure that systems can communicate once built. The United States Department of Transportation (USDOT) has provided guidelines for a National ITS Architecture, to help ensure that ITS systems developed in each state have the capability of communicating with systems developed nationally. The federal Transportation Equity Act for the 21st Century (TEA-21) requires state departments of transportation to ensure that ITS projects carried out using funds made available from the highway trust fund conform to the National ITS Architecture as well as USDOT adopted standards. While the USDOT has not formally yet adopted any ITS standards, the regulations for conformity with the national architecture became effective on April 8, 2001.

Essentially, the federal regulations mean that:

- Regions *currently* implementing ITS projects must have a regional ITS architecture in place by April 8, 2005. Regions *not currently* implementing ITS projects must develop a regional ITS architecture within four years from the date their first ITS project advances to final design.
- ITS projects funded by the highway trust fund and the mass transit account must conform to a regional ITS architecture.
- Compliance with the regional architecture will be in accordance with USDOT oversight and federal aid procedures, similar to non-ITS projects.

Figure 1 presents the full text of the federal regulation.

FIGURE 1

Intelligent Transportation System Architecture and Standards
AGENCY: Federal Highway Administration (FHWA), DOT
ACTION: Final rule.
http://www.its.dot.gov/aconform/wholetext.htm

940.9 Regional ITS Architecture

a. A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; Federal lands agencies; State motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration.

b. Any region that is currently implementing ITS projects shall have a regional ITS architecture by April 8, 2005.

c. All other regions not currently implementing ITS projects shall have a regional ITS architecture within four years of the first ITS project for that region advancing to final design.

d. The regional ITS architecture shall include, at a minimum, the following:
   1. A description of the region;
   2. Identification of participating agencies and other stakeholders;
   3. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture;
   4. Any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture;
   5. System functional requirements;
   6. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture);
   7. Identification of ITS standards supporting regional and national interoperability; and
   8. The sequence of projects required for implementation.

e. Existing regional ITS architectures that meet all of the requirements of paragraph (d) of this section shall be considered to satisfy the requirements of paragraph (a) of this section.

f. The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region.

STUDY PURPOSE

The latest USDOT regulations on conformity with the National ITS Architecture created a need to review and evaluate the implementation of ITS on a strategic basis and recommend ways in which the ITS process and plans in California could be improved. Accordingly, the California Department of Transportation (Caltrans), Division of New Technology and Research (New Tech), contracted with the Franklin Hill Group and PB Farradyne to conduct discussions with Caltrans district office staff and staff from Regional Transportation Planning Agencies (RTPAs) to explore:

- The extent to which existing plans meet federal requirements for consistency with the National ITS Architecture;
- The extent to which ITS projects in current plans have been implemented;
- Barriers (if any) to the implementation of ITS projects locally;
- The extent to which the plans consider connectivity between modes and across regions;
- Next steps needed to move forward in responding to the new federal regulations regarding the regional ITS architecture(s); and,
- Ways in which Caltrans can and should support the planning and implementation of ITS projects across the state.

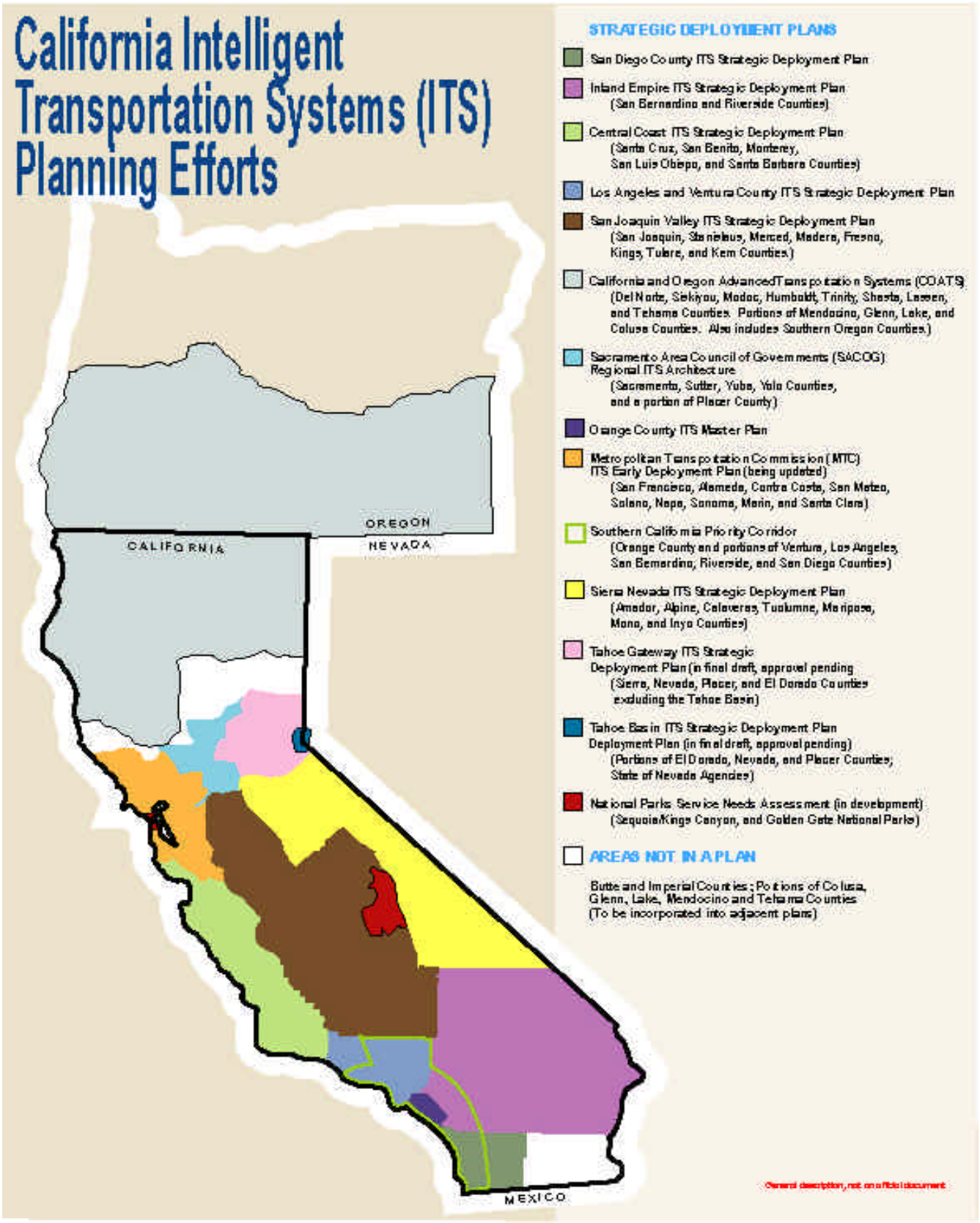
STUDY METHOD

The focus of information gathering was on the twelve ITS SDP/EDP planning areas in **Figure 2**. In each EDP/SDP planning area, the team conducted:

- An in-person meeting or telephone interview with Caltrans district office staff from both Planning and Traffic Operations;
- An in-person meeting or telephone interview with staff from the lead RTPA for the plan area; and,
- Telephone interviews and email follow-up with other key individuals involved in the SDP plan and/or ITS implementation in the region.

In the four rural ITS planning areas and the areas not currently covered by an SDP, the team relied primarily on telephone and email interviewing. The full list of over 85 persons interviewed, along with the interview guide, is presented in **Appendix A**. A bibliography of documents reviewed is in **Appendix B**.

FIGURE 2


California Intelligent Transportation Systems (ITS) Planning Efforts
STRATEGIC DEPLOYMENT PLANS
San Diego County ITS Strategic Deployment Plan
Inland Empire ITS Strategic Deployment Plan (San Bernardino and Riverside Counties)
Central Coast ITS Strategic Deployment Plan (Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties)
Los Angeles and Ventura County ITS Strategic Deployment Plan
San Joaquin Valley ITS Strategic Deployment Plan (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern Counties.)
California and Oregon Advanced Transportation Systems (COATS) (Del Norte, Siskiyou, Modoc, Humboldt, Trinity, Shasta, Lassen, and Tehama Counties. Portions of Mendocino, Glenn, Lake, and Colusa Counties. Also includes Southern Oregon Counties.)
Sacramento Area Council of Governments (SACOG) Regional ITS Architecture (Sacramento, Sutter, Yuba, Yolo Counties, and a portion of Placer County)
Orange County ITS Master Plan
Metropolitan Transportation Commission (MTC) ITS Early Deployment Plan (being updated) (San Francisco, Alameda, Contra Costa, San Mateo, Solano, Napa, Sonoma, Marin, and Santa Clara)
Southern California Priority Corridor (Orange County and portions of Ventura, Los Angeles, San Bernardino, Riverside, and San Diego Counties)
Sierra Nevada ITS Strategic Deployment Plan (Amador, Alpine, Calaveras, Tuolumne, Mariposa, Mono, and Inyo Counties)
Tahoe Gateway ITS Strategic Deployment Plan (in final draft, approval pending (Sierra, Nevada, Placer, and El Dorado Counties excluding the Tahoe Basin)
Tahoe Basin ITS Strategic Deployment Plan Deployment Plan (in final draft, approval pending) (Portions of El Dorado, Nevada, and Placer Counties; State of Nevada Agencies)
National Parks Service Needs Assessment (in development) (Sequoia/Kings Canyon, and Golden Gate National Parks)
AREAS NOT IN A PLAN
Butte and Imperial Counties; Portions of Colusa, Glenn, Lake, Mendocino and Tehama Counties (To be incorporated into adjacent plans)
OREGON
NEVADA
CALIFORNIA
MEXICO
General description, not an official document

KEY FINDINGS AND RECOMMENDATIONS

The evaluative findings of California's ITS strategic deployment plans, as determined from the interviews and the review of SDP documents, are presented in this section. The findings are organized into three key findings, presented with sub-findings and recommendations, as applicable.

1. All of California's Intelligent Transportation System (ITS) Strategic Deployment Plans (SDPs) have a framework in place to enable them to be in conformity with the National ITS Architecture regulations by 2005.

All of the twelve plans or planning areas either currently have a regional ITS architecture that conforms to the National ITS Architecture guidelines, or are in the process of updating their regional architecture. The large urbanized areas of the northern and southern portions of the state, which tended to be early implementers of ITS, are in the process of updating their regional architectures. The central and rural areas of California tend to either have just completed or be close to final completion of their plans, and these newer plans were designed to be in conformance with the National ITS Architecture.

Each of the EDP/SDP areas is discussed more fully in the findings that follow. **Table 1** at the end of this section is a summary evaluation of each of the EDP/SDPs.

CENTRAL AND RURAL NORTHERN CALIFORNIA

In Central and Rural Northern California, the plans and regional architecture definitions are all relatively recent and were designed to be in conformity with the National ITS Architecture. The challenge for these areas is to expand the level of stakeholder involvement and maintain the plans.

Three plans in the central and rural regions were completed in 2001: San Joaquin Valley ITS SDP, the Central Coast ITS SDP, and the California-Oregon Advanced Transportation System (COATS). Three plans in other rural areas are in the process of completion for 2002: Tahoe Gateway, Tahoe Basin and Sierra Nevada. All of these recent plans follow the National ITS Architecture guidelines in describing the regional architecture, and all of them appear to have been conscientious in involving the full array of stakeholders in the plan process. The northern California office of the Federal Highways Administration (FHWA)

provided the San Joaquin Valley ITS SDP a letter indicating that their plan did indeed meet the federal guidelines.

The key issue for these plan areas will be to maintain the level of interest among stakeholders once the plan has been adopted. Any support that may be provided by the local Caltrans district offices to their plan area constituents would undoubtedly be welcome.

SAN FRANCISCO BAY AREA

The Metropolitan Transportation Commission (MTC), the metropolitan planning organization (MPO) for nine counties in the San Francisco Bay area, was one of the early implementers of ITS and completed an EDP in 1996. This EDP described eight projects to enhance management and operations of the Bay Area's transportation infrastructure. In interviews, MTC staff confirmed that seven of these eight projects identified in the EDP have been implemented. However, the EDP did not describe a regional architecture in the level of detail needed to be in conformity with the later National ITS Architecture.

In 2001, the MTC contracted to develop a regional architecture and ITS deployment plan that is "consistent with National ITS Architecture guidelines and requirements…" This project is to be completed by 2005, as per federal guidelines. From the interviews, it appears that Caltrans District 4 and local planning agencies are heavily involved in the plan update process.

SACRAMENTO AREA

The Sacramento Area Council of Governments (SACOG), the MPO for four counties and portions of a fifth, was also an early implementer of ITS and completed an EDP in 1996. In 1999, SACOG adopted the architecture for the Sacramento County Transportation Management Center (TMC), referred to as the Sacramento Transportation ARea NETwork (STARNET), as its regional architecture.

In 2001, SACOG completed a regional architecture study conducted to ensure that SACOG's adopted architecture had sufficient detail in five specific areas: Operational Concept; System Functional Requirements; System Interfaces; Project Sequencing and Agency Operational Agreements. Partially because of its efforts in building a strong stakeholder base, SACOG was able to obtain an earmark for state funds to update the StarNET architecture and update the 1996 EDP to fulfill remaining Operational Concept and Project sequencing requirements.

1.1 Other than the detailed findings noted below, there is no need for further ITS SDP development at the regional level in California. Developing the plans has proven to be a highly successful process extensively supported by stakeholders.

One of the lasting achievements of the ITS SDP process was the dialogue it fostered among local transportation stakeholders. And continual involvement of stakeholders is one of the guidelines in the federal architecture regulation.

In many areas, dialogue among stakeholders has continued past the adoption of the SDP. Standing committees include:

- Priority Corridor Steering Committee;
- Central Coast ITS Steering Committee;
- San Joaquin Valley ITS Steering Committee:
- COATS Steering Committee; and,
- Sacramento Region ITS Partnership.

There was some concern that with the demise of federal ITS funding, once an SDP was adopted, the level of interest and willingness among local agencies to devote staff resources to ongoing plan maintenance was declining. One district noted that local agencies were asking for funding to support staff time to attend ITS steering committee meetings. Several RTPA staff indicated they felt that there were sufficient regional committees in place to support ITS activities, such as local traffic forums.

There are several ITS plans being developed around the state that are in support of a particular ITS project for sub-regions of larger SDP study areas. For example:

- The Silicon Valley – Intelligent Transportation Systems (SV-ITS) program, coordinated by the City of San Jose, includes seven cities and towns in Santa Clara and Alameda Counties. The focus is on the use of fiber optic technology to link the TMCs of each partner agency to enable regional traffic management. The SV-ITS program is part of the MTC EDP (SDP in process) planning area.
- Pomona Valley Intelligent Transportation System (PVITS), sponsored by the County of Los Angeles Department of Public Works and seven cities, is to update a 1995 signal synchronization study, make system recommendations for the State Route 60 Corridor Advanced Traffic Signal Improvement Project and develop an ITS conceptual design for the Pomona Valley. PVITS is part of the Southern California Priority Corridor planning area.

- I-580 Smart Corridor Deployment Project, which is being coordinated by the Tri-Valley ITS (Cities of Pleasanton, Dublin and Livermore) and includes Alameda County (representing Castro Valley).

There is no compelling case for further investment on the part of Caltrans, or the RTPAs, in revisions or updates to these plans in advance of 2005. The indications are that the emphasis in the future will be on configuration management particularly to oversee inter- and intra-regional developments.

Recommendation

Recommendation 1.1 Caltrans New Tech staff should focus their activities on offering training and technical ITS deployment support to both regional transportation planning agency (RTPA) and Caltrans district office staff.

SOUTHERN CALIFORNIA

1.2 The Southern California Showcase architecture, which served as a model for the National ITS Architecture, is not yet sufficiently documented in terms of interface requirements and information exchanges. This particularly affects new projects that need to access the regional network.

ITS planning in Southern California is best conceptualized as a hierarchy of multi-level ITS plans and architectures.

- At the top of the hierarchy is the Southern California Priority Corridor (Showcase), which was designed to provide interregional ITS connectivity. In some cases it is also used to provide intra-regional connectivity as well.
- At the next level down are county-wide architectures, which exist and are the subject of continuing development in Los Angeles, Orange and Ventura counties. These county-wide architectures support a variety of ITS projects that may or may not yet be connected to Showcase. The other Southern California counties, San Diego, San Bernardino and Riverside, use Showcase as the basis of their county-wide architecture.
- Within Los Angles County, there is a third level with separate ITS architectures being used or developed by the Los Angeles County Department of Public Works and the Los Angeles County Metropolitan Transportation Authority (LACMTA). These architectures are being developed specifically for the traffic forums and arterial road system data.

To fully appreciate the complexity of the regional architecture(s) in Southern California, it is important to understand the transportation planning context. The Priority Corridor includes five of the six counties within the Southern California Association of Governments (SCAG), which is the metropolitan planning organization (MPO), for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. SCAG works through a Regional Council and 14 subregional councils and projects are advanced through the local planning process by transit agencies, counties, and cities as well as the subregional councils.

SCAG has a comparatively small staff and operates predominately as a pass-through agency for the majority of state and federal funding. While ITS developments have enjoyed the support of a small section of SCAG ITS staff, regional high level consensus building around a single architectural concept and the necessary infrastructure to support it has not been attempted. SCAG has participated in the Priority Corridor Steering Committee but has not taken a strong leadership role.

Corridor-wide Architecture

The Priority Corridor has been managed by staff from the San Diego Association of Governments (SANDAG). SANDAG, which is the MPO for San Diego County, by comparison enjoys a far simpler set of relationships with its partner institutions (one county and 18 cities.) They have built consensus around the concept of a regional ITS architecture, built support for the regional ITS plan and included it prominently in their Regional Transportation Plan.

The Southern California area also includes four Caltrans district offices:

- District 7, which includes Los Angeles and Ventura Counties;
- District 8, which includes Riverside and San Bernardino Counties;
- District 11, which includes San Diego County; and,
- District 12, which includes Orange County.

The four district offices have not traditionally operated with a common vision, and have also not always had close working relationships with local jurisdictions.

The Southern California ITS Priority Corridor was one of four corridors of national significance identified for early ITS deployment by Congress under the provisions of ISTEA. The corridor boundaries extend from the US-Mexico border in San

Diego north to Ventura County, generally along Interstate Highway 5. The area encompasses 10,000 square miles and includes nearly 150 transportation-related agencies, including the four Caltrans districts, the California Highway Patrol (CHP), multiple MPOs, six counties, 124 cities, transit operators and regional air quality agencies. Many of the transportation agencies in this area had already begun to develop and deploy ITS applications, and the challenge for the Priority Corridor was to weave these "legacy" systems into a seamless whole.

The interregional architecture was developed by a federally-funded advanced transportation management and information system demonstration project called "Showcase." Showcase projects were ambitiously conceived as systems that could be integrated with one another across the corridor. The projects were also viewed as demonstrations that could be "designed once and deployed many times." As currently designed, the Priority Corridor uses a distributed center-to-center Showcase architecture based on Kernel 1.0. The centers are located in and operated by the four Southern California Caltrans district offices (7,8,11, and 12). Showcase includes projects that have been promoted and managed by SANDAG, the Los Angeles County Metropolitan Transportation Authority (LACMTA) and the Orange County Transportation Authority (OCTA), the cities of San Diego and Fontana, and Caltrans.

There is a second aspect of ITS infrastructure being implemented in the region, as part of the transportation management centers (TMCs). Caltrans is currently standardizing its Advanced Transportation Management System (ATMS) through ATMS version 2.0, which was developed in Caltrans District 7. An interface between ATMS v2.0 and Showcase is currently being constructed. This means that ultimately all of the Caltrans traffic management system data statewide will have the same look and feel, and could be viewed on one seamless statewide map.

County-Level Architecture

Los Angeles County, Orange County and Ventura County all have or are developing independent systems that will offer ITS integration to agencies within their counties.

In Orange County, OCTA and District 12 exchange ITS information through a separate system that predates the Priority Corridor. OCTA's traveler information system, TravelTIP, is not yet connected to Showcase. There are plans to bring TravelTIP into compliance with Showcase to close up this "information gap"

within the corridor. This upgrade is planned to be included in the Corridor-wide ATMS project

Ventura County, with historically lower levels of congestion, has relatively little ITS infrastructure. The need for increased detection devices and their locations has been the subject of discussion and study by Caltrans and the Ventura County Transportation Commission (VCTC). In addition Ventura County also has a separate internal county ITS set of initiatives, operated by the VCTC. VCTC has long been a pioneer in the use of web disseminated multi-modal traveler information using their www.goventura.org site. VCTC also provides the data management for the county's integrated transit smart card system, which started as an FHWA-supported field operational test of an earlier version of the smart card.

Both Riverside and San Bernardino counties, as mentioned above, use Showcase as the basis of their county-wide architecture.

Within Los Angeles County Architecture(s)

Within Los Angeles County, there are essentially two approaches to integrated ITS systems. First, there is Showcase Kernel 1.0 which serves as the control component of the regional information exchange network, and which has been recently deployed at Caltrans District 7. Showcase is the architecture for many of the ITS projects supported by the LACMTA. Second, there is the Information Exchange Network (IEN), which has been developed by the Los Angeles County Department of Public Works for the exchange of arterial traffic data among all members of the traffic forums. Whether and how the IEN should be interfaced to Showcase has been the subject of local dispute.

The City of Los Angeles Department of Transportation (LADOT) has funding from LACMTA to develop integrated interfaces between LADOT's Advanced Traffic Signal and Control (ATSAC) system (an arterial system) and both Showcase (giving them access to ATMS data) and the County IEN. LACMTA is currently developing an ITS plan for the arterial system that will use the IEN for data exchange. And there are discussions occurring regarding the creation of an interface that will enable Showcase data to be downloaded into the IEN. Thus it is likely that the sheer volume of ITS elements being deployed, coupled with the desire of local agencies to view the data, will push for an integration of the two systems.

Despite the multi-layered appearance of the Southern California

Summary of Southern California Regional Architectures

regional architecture it must be commented that the necessary elements are in place for integration of ITS both across the corridor and within discrete sub-regions and for discrete purposes. The ambitions of Showcase have yet to be fully realized and there are deployment problems that have yet to be fully resolved. However, the understanding of the potential benefits of integration has been recognized at all levels. In a region as complicated as Southern California multiple solutions are to be expected.

A key lesson learned from the Southern California experience is that deployment of major ITS integration systems takes far longer, and requires more resources, than could ever be anticipated at the outset. However, the Priority Corridor project continues to provide the essential and visionary groundwork for regional integration.

The scoping and design of the Showcase Kernel 1.0, which is the key element for the corridor-wide exchange of data, was a lengthy process. Showcase has been documented as part of a "high level design." However, there has been little to no recent detailed documentation of Kernel 1.0 and the regional network that would permit anyone other than the consultant firm that designed the system to design interfaces. Details of the interactive data language (IDLs) and some of the interface requirements are "not as robust as we would like to see". It was reported that a Request for Proposal (RFP) was expected to be released for a guidebook to this subject. The lack of detailed documentation is delaying the deployment of regional ITS projects that require connections to the Showcase network. However, it should be noted, that the Showcase architecture is not static and new elements continue to be incorporated.

As previously indicated, SCAG has not provided strong leadership in the development of political consensus in support of a regional ITS architecture. SCAG ITS staff indicated they were seeking funding for consultant assistance to update a regional plan and architecture with an emphasis on gap closure. However, as of the time this report went to press, the funding for this update had not been secured and it appears that any future needed update activity will be undertaken by the individual counties.

The current Showcase documentation needs to be better documented, specifically with regard to section d.6. of the federal regulation regarding Interface Requirements and Information

Exchanges**.** Some activities are being conducted by local agencies, such as the LACMTA. However, it could be argued that the existence and deployment of the Showcase Kernel 1.0 is sufficient as a fulfillment of the strategic intent of the rule. And it must be realized that the many, more detailed elements that are essential to fully realize the potential of Showcase are likely to be developed over the next decade.

Recommendation

Recommendation 1.2 Caltrans should closely monitor the Southern California response to the need for Showcase architecture documentation as it relates to integration with new projects.

The responsibility for providing the detailed documentation for Showcase interfaces rests squarely with the agencies involved in the Southern California Priority Corridor. That said, there are many agencies involved, including FHWA, Caltrans New Tech, Caltrans district offices, SCAG, county agencies and local transit agencies. Caltrans as an agency, though, has a clear responsibility to monitor the situation and encourage all parties to seek an expeditious solution to the documentation issue.

IMPERIAL COUNTY

1.3 Imperial County (one of the six counties in the Southern California Association of Governments region) is not formally part of an ITS SDP area. However, Imperial County has strong potential for ITS at its two border crossings.

Imperial County is part of Caltrans District 11 (San Diego) as well as one of the six counties in SCAG. However, Imperial was not specifically defined as part of the Southern California Priority Corridor. At this point, Imperial has not been directly incorporated into either the District 11 or SCAG ITS planning efforts. Imperial County Public Works staff interviewed felt that there was no need for an ITS plan, since there was no traffic congestion and few traffic signals in the county.

While Imperial County includes two border crossings with Mexico and has the potential for involvement in ITS applications for freight movements, there does not appear to be a compelling need for a separate ITS plan for the county. Accordingly, it is recommended that Caltrans New Tech staff provide technical assistance and possibly training to support Imperial County in joining an existing ITS SDP.

Recommendation

Recommendation 1.3 Caltrans should provide technical training and assistance to Imperial County staff to enable them to join an adjacent ITS Plan area.

RURAL NORTHERN CALIFORNIA

1.4 There are a few counties and portions of counties in Northern California that through oversight are not formally part of an ITS strategic deployment plan region. In each of these counties, there does not appear to be sufficient ITS activity, either planned or programmed, to warrant a separate county ITS SDP.

Most rural northern California county planning agencies were involved in the California-Oregon Advanced Transportation System (COATS) SDP. However, the COATS study area was defined not by county lines but by roadway segments. This approach technically left portions of seven counties (Colusa, Glenn, Lake, Lassen, Mendocino, Plumas and Tehama) out of the COATS SDP and out of any other ITS plan. Interviews conducted with RTPA staff in these counties indicated that some of them had always intended the full county to be part of COATS. Those counties that are part of District 2, which has committed to maintaining the COATS plan, should work with District 2 to ensure that their entire county adopts a consistent regional architecture (this includes Lassen, Plumas and Tehama counties). Similarly, the two counties in District 1 that are partially included in COATS (Lake and Mendocino), should also be assisted to work with District 2 to ensure that their entire county has an ITS architecture defined.

The Colusa County Transportation Commission and the Glenn County Regional Transportation Commission had portions of their respective counties that were included in the COATS study area, but are both part of Caltrans District 3 and are adjacent to the Sacramento Area ITS SDP study area. These counties may need Caltrans assistance to determine which of the two ITS SDP study areas and architectures would be appropriate for the remaining portions of their respective counties.

Butte County Association of Governments (BCAG) was not part of COATS, nor part of the Sacramento Area ITS SDP. At one point, Caltrans New Tech was seeking funding to assist BCAG in developing its own ITS SDP. However, this funding never materialized. At this point, in order to meet the federal regulations by 2005, BCAG should be assisted to partner with either the Sacramento Area ITS SDP or COATS. While Butte

County is predominately rural, the Sacramento Area ITS SDP study area is a reasonable alternative since Butte is also in Caltrans District 3.

Recommendation

Recommendation 1.4 Caltrans New Tech staff should assist with the formulation of language that includes the overlooked counties and portions of counties for inclusion in existing SDP updates. The affected RTPAs are:

- *Butte County Association of Governments, Colusa County Transportation Commission, and Glenn County Regional Transportation Commission should be assisted in partnering with either COATS (District 2) or the Sacramento Area ITS SDP;*
- *Lake County Council of Governments, Lassen County Transportation Commission, Mendocino County Organization of Governments, Plumas County Transportation Commission, and Tehama County Transportation Commission should be assisted in including the entire county in COATS (District 2).*

1.5 All of the SDPs reviewed were weak with respect to the operating agreements section (d. 4) of the federal rule. Generic operating agreements are not required by FHWA to be developed in advance, but a listing of anticipated agreements is expected.

Section d.4 of the federal rule for regional ITS architectures refers to the following minimum inclusions:

> "…any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture."

Such agreements do exist in the plans, but at a very high level--often at the level of data flow diagrams and broad agreement in support of the architecture. This is a subject that does not receive much attention in the plans since detailed agreements are typically negotiated as the need arises and as project designs advance. Detailed agreements on the requirements to make projects fully interoperable so that new partners can be added over time also overlaps into 9409.9 section d.6 which refers to interface requirements.

However, as the Priority Corridor partners are now finding, “the devil is in the details” and interface requirements need to be extremely robust to ensure the long-term development potential of ITS interoperability. This is an area of future development and documentation that will need to be pursued over the next few years as more ITS projects are deployed. The SDPs themselves will not need to be repeated but the coordinated management of projects and interfaces are where future emphasis will need to be placed.

Recommendation

Recommendation 1.5 Caltrans New Tech should identify and gather best practice examples of ITS local partnership agreements, and make these best practice examples available to the Caltrans district offices and local RTPAs as the need arises.

Table 1 on the following pages summarizes the evaluation of the regional plans and regional architecture.

Table 1. ITS Early Deployment Plan/Strategic Deployment Plan Evaluation Summary		
SDP/EDP Region	**Plan Status**	**Regional Architecture Status**
Southern California Priority Corridor	SDP completed in 1998. No plans to update the plan but other documents are extending scope for corridor-wide integration, such as: ➢ Configuration Management Plan, 12/2000 ➢ System Integration Plan, 9/2001	Showcase architecture described at high level in various documents. No recent detailed documentation of the latest version of Kernel 1.0 and regional network that allows new systems to readily design interfaces. Details of the IDLs and some of the interface requirements are "not as robust as we would like to see". Reportedly an RFP is expected to be released for a guidebook to this subject. Currently the Showcase servers and systems are housed and operated at Caltrans District 7 in Los Angeles. Kernels have also been installed in Districts 8, 11 and 12 but full operation has been delayed pending resolution of control issues with Caltrans Information System and Service Center (ISSC).
Southern California Association of Governments (SCAG)	There is no single plan document for the entire SCAG region and it seems unlikely that there will be. The multi-layered architecture developed within the region is the practical response which has developed in its place. SCAG has not taken a strong leadership role in the development of political consensus in support of a regional ITS architecture. One initiative to contract for consultant assistance to update a regional plan and architecture with an emphasis on gap closure has failed to find funding support. It would seem that the greater SCAG region is too large and politically complex to support such an initiative.	SCAG has adopted the Showcase architecture from the Southern California Priority Corridor for interregional connectivity.

Table 1. ITS Early Deployment Plan/Strategic Deployment Plan Evaluation Summary		
SDP/EDP Region	**Plan Status**	**Regional Architecture Status**
Los Angeles County Metropolitan Transportation Authority (LACMTA)	An SDP was completed in 1998 for both Los Angeles and Ventura Counties. The two counties are now also pursuing separate ITS architectural activities. See VCTC below.	The MTA has initiated an ITS architecture plan for the arterial road system in Greater Los Angeles. This plan builds on the Los Angeles County architecture for traffic and signal data exchange through the Integrated Exchange Network (IEN). The MTA has begun a project, Regional Integration of ITS (RIITS), that will offer integration support and help fill some communication gaps between local systems and Showcase. The project emphasizes transit, airport and port links to Showcase. The MTA is close to completing a regional advanced traveler information system that has been designed to interface with Showcase. This project together with RIITS referred to above indicate the acceptance and support for the regional architecture.
Orange County Transportation Authority (OCTA)	Completed the first regional ITS (then IVHS) plan in 1994, subsequently updated in 1998. OCTA has plans to contract for consultant assistance to update their plan in the next year. OCTA staff have questioned the need for all forms of ITS information to be linked at the regional level.	Have adopted Showcase architecture for interregional connectivity, including connectivity with District 12. Have own architecture for intra-county ITS. However, key ITS project, TravelTIP, is not Showcase compatible.
Ventura County Transportation Commission (VCTC)	Los Angeles and Ventura Counties completed a joint SDP in 1999. Ventura recently completed an ITS strategy document (September, 2001).	Have a countywide architecture element in the 2001 document that will be updated and maintained by VCTC.
Inland Empire *(Riverside and San Bernardino Counties)*	SDP completed in 1999	Following SCAG's lead, adopted Showcase architecture. Regional architecture in need of definition and update and SCAG is supporting a funding request.

Table 1. ITS Early Deployment Plan/Strategic Deployment Plan Evaluation Summary		
SDP/EDP Region	**Plan Status**	**Regional Architecture Status**
San Diego County	Completed an SDP in 1997. SANDAG updates and maintains county plan	Adopted Showcase architecture in 1996 RTP; plans to include explicit adoption of regional architecture in 2004 RTP.
San Joaquin Valley (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare and Kern Counties)	Final Plan completed September, 2001. All eight county COGs/RTPAs formally adopted plan. FHWA endorsed plan in letter to San Joaquin COG. The challenge for the Valley is to keep the stakeholders' interest now that the plan is completed and there is no separate funding for ITS.	Regional architecture conforms to national architecture guidelines.
Central Coast (Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties)	Final Plan completed June, 2000. All county RTPAs (except one) have endorsed the ITS SDP in their RTP. Key issues are funding and keeping the interest and focus of stakeholders now that the plan is completed. The plan leader, Association of Monterey Bay Area Governments (AMBAG), has applied for a Caltrans grant to hire a consultant to update and maintain the plan.	Regional architecture defined at a high level. ITS standards and interface requirements are still being worked out.
Metropolitan Transportation Commission (MTC) (San Francisco, Alameda, Contra Costa, San Mateo, Solano, Napa, Sonoma, Marin, and Santa Clara Counties)	Completed an EDP in 1996. MTC selected consultant in 2001 for plan update which is expected to be completed by 2005. ITS activities have been underway in the Bay Area for some time, and it will be a challenge to develop a regional architecture that "represents as comprehensively as possible all transportation stakeholders in the area, their current systems and their plans for future projects."	No clear architecture defined in the EDP. Major task of the current update is to develop a regional ITS architecture and deployment plan. Intent is that new plan will conform to all national architecture guidelines.

Table 1. ITS Early Deployment Plan/Strategic Deployment Plan Evaluation Summary		
SDP/EDP Region	**Plan Status**	**Regional Architecture Status**
Sacramento Area Council of Governments (SACOG) (Sacramento, Sutter, Yolo, Yuba and portions of Placer County)	Completed an EDP in June 1996. In June 2001, completed definition of a regional architecture. Have plans to contract for consultant assistance in updating and maintaining Plan.	The adopted architecture is based on the TMC's architecture, referred to as the Sacramento Transportation ARea NETwork (STARNET).
Tahoe Gateway (Sierra, Nevada, Placer and El Dorado, excluding the Tahoe Basin)	Final Plan in production; final report including architecture should be available in March, 2002.	Architecture designed to be in conformance with national architecture guidelines. Intent is for the Plan to be maintained and updated by SACOG.
Tahoe Basin (Portions of El Dorado, Nevada, and Placer Counties)	Plan in progress; expect completion in 2002.	Architecture is being designed to be in conformance with national architecture guidelines. Intent is for the Plan to be maintained and updated by Tahoe Regional Planning Agency.
Sierra Nevada (Amador, Alpine, Calaveras, Tuolumne, Mariposa, Mono and Inyo)	Plan completed in 2002. A major challenge to plan development was communication across the Sierra Nevada mountains, which bisect the plan area.	Architecture was designed to be in conformance with national architecture guidelines.
California-Oregon Advanced Transportation System (COATS) (Del Norte, Siskiyou, Modoc, Humboldt, Trinity, Shasta, Lassen, Tehama and portions of Mendocino, Glenn, Lake and Colusa)	Plan completed in May 2001.	Architecture was designed to be in conformance with national architecture guidelines. Intent is for the Plan to be maintained and updated by Caltrans District 2 in Redding.

2. ITS in California has moved from the planning stages to deployment. A key barrier to deployment is funding for ongoing maintenance and operations of ITS elements and projects.

ITS DEPLOYMENT

The definition of ITS encompasses almost every type of transportation information that can be transmitted electronically. And with California's long-standing interest in computer technology, it should be no surprise that ITS elements have been deployed in great numbers around the state. The California Alliance for Advanced Transportation Systems (CAATS) Statewide ITS Inventory, along with the USDOT's ITS deployment inventory, contains an extensive list of ITS projects.

Generally, areas with early ITS planning activities and interests got ahead in funding and deploying their projects. A successful example would be Orange County's pioneering TravelTIP traveler information project. The Showcase projects also demonstrate the importance of federal dollars in stimulating major initiatives. Caltrans through its TMCs and the deployment of detection and information dissemination devices has also laid the foundation of ITS infrastructure.

While everyone involved would agree that the ITS SDP planning process has been useful in encouraging greater communication among transportation stakeholders, some felt that the process was less useful in terms of ITS implementation.

"ITS process is less important than ITS project implementation."
RTPA staff

All of the ITS SDPs in the central and rural areas of California were completed within the past two years. Of these recent SDPs, relatively few of the projects that were planned have been funded through either the local RTPA's Regional Transportation Plan (RTP) process, or the local Caltrans district office. For example, the San Joaquin Valley ITS SDP has a 32-page list of ITS planned projects by county. According to staff from one of the larger RTPAs in the Valley study area, not one of the projects in their county has yet been funded. There are a number of reasons for this, including funding issues. It is also the case that it may simply be too soon after plan development to expect ITS deployment. Many of the successful ITS projects were originally identified in their area's EDP/SDP years before they were implemented.

And there is the issue that these newer plans are being completed at a time when there is no separate funding for ITS. Many of the early ITS projects were given a boost with federal ITS funding. This is also the case with the innovative COATS rural applications that have stimulated thinking about more rural ITS projects.

Many Caltrans districts reported building ITS components as part of other major projects. Urban districts mentioned funding loop detection, closed-circuit television (CCTV) and changeable message signs (CMS) as part of freeway widening projects. Rural Caltrans districts indicated they are sometimes able to fund traveler information systems (CMSs and/or highway advisory radios--HARs) as part of bridge rehabilitation or roadway repair projects. There were several districts that pointed to their TMC as an example of ITS deployment.

There is a wealth of ITS activity that has been funded, built, operated and maintained by local agencies—counties, cities, transit operators, and public safety services. The early projects often began with freeway management, and then moved toward traffic signal coordination, followed by consideration of links between the two. In recent years there has been accelerating interest in ITS applications for transit. A recent SCAG study of ITS and transit identified 84 significant projects. These included a LACMTA $27 million Universal Fare System, a $2.3 million global positioning system (GPS) train location system for Metrolink, and an $80 million advanced transit management system for LACMTA buses. Note that many of these ITS elements are being mainstreamed in projects that do not necessarily involve Caltrans, either at the statewide or the district level.

ITS SUCCESSES

If success is defined as an ITS project that has been implemented and is currently operating as planned, then the major successes are traveler information and traffic management centers.

Of the projects offered as examples of successful ITS projects, two were traveler information projects, including:

- Orange County's TravelTIP: TravelTIP, identified as a key project in Orange County's 1993 EDP, was one of the traveler information projects in the nation. It provides "up-to-the-minute traffic conditions on freeways and streets, as well as transit information in Orange County via the Internet (www.traveltip.net), telephone, or touch-screen

kiosks.

- MTC's TravInfo: TravInfo was first funded in 1993 by USDOT (one of 16 ITS field operational test projects nationwide). The current deployment initiative is being funded by the federal Congestion Mitigation and Air Quality (CMAQ) Improvement Program. TravInfo provides information about San Francisco Bay Area traffic and road conditions, public transit routes and schedules, carpooling, highway construction and road closures, van and taxi services for disabled travelers, park-and-ride facilities, and bikeways. Information is provided via the Internet (www.travinfo.org) and telephone. Expansion of TravInfo was one of the eight key ITS projects identified in the 1996 Bay Area EDP. The project is still in the early stages of full deployment and shows great promise; however, the issue of long-term sustainability has yet to be addressed.

It should be noted that these successes are projects that have taken seven or more years to implement.

The other successful ITS projects offered were Transportation Management Centers (TMCs). The TMCs mentioned as successes tended to involve partnerships between district offices and the local RTPAs and other agencies within their area. For example:

- District 8 in San Bernardino is building a new TMC with $6 million in funding from the San Bernardino Council of Governments and additional funding from the Riverside County Transportation Commission.
- District 4 has a project to share control of the video cameras on certain segments of the freeway with the City of San Jose TMC.
- District 2 pointed to the dynamic message signs on I-5 at the five worst accident locations to contributing to a 20-30% reduction in accidents.

Success also could be defined as funded and in progress ITS infrastructure projects that address the major issues of intra- or interregional connectivity, but are not yet fully operational. Among the foremost among California's ITS projects that address the major issue of interregional connectivity is the Southern California Priority Corridor Kernel 1.0. For a number of technical reasons that do not seem altogether associated with the software that has been developed and tested, data are not currently flowing between the deployed kernels. There are still many steps remaining, and more time needed, before this

ambitious project is fully realized. And it should be noted that by the time the full project is ready, some of the elements will be obsolete. This should not detract from recognition of the importance of the Priority Corridor project in regional integration. Rather, it suggests that the lesson to be gleaned is that such projects are intensely time consuming and difficult from both the technical and the institutional viewpoint.

A completely different set of ITS activities is the rural COATS project. This too is a work in progress in which not all of the elements are fully, deployed, tested and evaluated. However, the vision of creating an ITS architecture for so large a rural area and the consensus building required to achieve it must be deemed a success by any standards. A large stakeholder group is still meeting and there is considerable active involvement in projects.

A third project which is also tested and deployed but not currently receiving real-time data is the LACMTA project IMAJINE. This project has the capability of merging freeway data (Caltrans District 7), arterial data (City of Southgate) and transit data. It was awarded the 2001 CAATS prize for best ITS architecture and was conceived as a Showcase project that would demonstrate the concept of multi-modal data integration.

BARRIERS TO DEPLOYMENT

2.1 Ongoing maintenance and operations of ITS infrastructure is a major barrier to ITS deployment. Many regional agencies look to their Caltrans district to provide the maintenance and operations of the ITS backbone region-wide.

Much of the initial ITS infrastructure was implemented with federal and state funding (e.g. Showcase, ATMS, TMCs). The federal funding is winding down, and recently FHWA has called into question the use of federal funds to operate Showcase. Many regional agencies are looking to Caltrans to provide for the maintenance and operations of the interregional hardware and software.

According to Caltrans staff from several districts, ITS elements were initially mainstreamed into many highway construction or reconstruction projects and were in the Project Initiation and Project Development Documents. However, once the project was underway, if there were any cost increases the ITS elements were usually among the first to be eliminated. It should be noted

that this mainstreaming of ITS elements into Caltrans highway projects varied tremendously from district to district, with some districts routinely examining ITS for inclusion in all projects and others almost never including ITS elements.

Caltrans district staff commented that ITS projects were not competitive internally for SHOPP monies, especially when compared to capacity building projects. Some suggested that if Caltrans wanted to support interregional connectivity, it would set aside specific funding.

RTPA staff also felt that ITS projects were less competitive for Regional Transportation Improvement Program (RTIP) funding, given the huge list of projects that were submitted by member agencies. Unless a member agency placed an ITS project at the top of their list, it was not likely to be funded. Many RTPA staff wanted federal funding of ITS projects to be included in the reauthorization of TEA-21, and looked to Caltrans New Tech staff to assist in coordinating the state's input into the reauthorization legislation.

Support for state level earmarked funding for ITS was mixed. Some agencies reiterated district staff's comments that state funding of interregional ITS connectivity projects should be a priority. One senior RTPA staff suggested that priority or earmarked funding for ITS be identified within currently restricted funding categories; that the problem was that ITS was currently funded with the less restricted monies where there is the most competition.

Other RTPA staff expressed concerns that setaside funding could be too restrictive on local priorities. Still others felt that if ITS was indeed a successful strategy, then it would be funded and maintained by local general funds. Many rural agencies commented that the reality was that all too often their decisions were focused on whether to maintain asphalt road surfaces or allow them to return to gravel. Their concerns were focused on the hard choices that had to be made at the local level that reflect the reality of available budgets.

The federal regulations call for the ITS SDP to identify "the roles and responsibilities of …stakeholders in the operation and implementation of the systems included in the regional ITS architecture." While all of the current SDPs clearly identify roles in the implementation of new ITS projects, there is less clarity in the discussion of which entities will maintain (and fund) the

maintenance of the systems once implemented.

There needs to be a real examination of how the maintenance and operations of regional ITS infrastructure is funded. In some areas, the practice seems to be that if the local agencies provide the capital to build a system, the Caltrans district maintains it. For example, Alameda County installed ITS equipment along the Smart Corridor on San Pablo Avenue and then turned it over to Caltrans District 4 to maintain. However, it should be noted that this practice is not universally supported by the district offices. One district staff noted that the inability to adequately fund the continuing costs of operations and maintenance has led some districts that implemented systems early on be forced to watch the systems fall into disrepair.

In other areas, the district will only maintain what they have built. The local agencies in these areas either continue to maintain the ITS elements themselves (e.g. public works departments) or contract out for maintenance (especially as is the case for fiber optics).

It may be unreasonable to assume that Caltrans districts will provide the sole support for the maintenance and operations of interregional ITS systems. In these case, subscription or shared financing of ongoing support may be more appropriate. Certainly the local agencies would prefer that Caltrans provide the necessary operations and maintenance at no charge to them. But this may no longer be feasible within California's current transportation funding environment.

Recommendation

Recommendation 2.1.1 Caltrans New Tech should work with Operations and Maintenance staff to assist the deployment of ITS by identifying cost sharing or other mechanisms for providing for the ongoing operations and maintenance of ITS.

Ongoing operations and maintenance of the Showcase Priority Corridor servers and software is an issue that has not been adequately resolved within Southern California. The Priority Corridor has been paying for the operations and maintenance of its WAN lease with federal Showcase monies. FHWA indicated that they were in the process of denying further use of their funds for operation and maintenance. Caltrans District 7, which currently houses and operates the Showcase server, has also indicated that it is not "going to fund the Showcase network forever."

The issue of maintenance of ITS infrastructure is also an important local issue in Southern California. The LACMTA has steadfastly upheld the principle that it will not fund the long-term operation and maintenance of ITS projects. The only wavering in this strict policy has been an agreement to fund communications cost for the traffic forums for a period of 10 years. This has created difficulties for Showcase projects such as IMAJINE and the Los Angeles/Ventura County Advanced Traveler Information project. It also means that Los Angeles County Department of Public Works is seeking assurances from local cities, which are to receive capital investment in ITS equipment such as field detection, surveillance and information dissemination, that they will fund the operation and maintenance of these systems. How such costs can be shared in the case of regional systems is currently the subject of study and debate. There is also a case for first demonstrating the value of the equipment before asking local politicians to commit to operations and maintenance support.

It should be noted that not all Southern California local agencies encounter such problems. Both SANDAG and OCTA commented that they budgeted appropriately for the operation and maintenance of ITS systems just as they did for other infrastructure.

Recommendation

Recommendation 2.1.2 Caltrans should elevate the discussion of the continued operation of Showcase within Caltrans headquarters and encourage the formation of a policy regarding Showcase that would apply to all four local District Offices (7, 8, 11 and 12).

Implementation of ITS infrastructure projects tends to require a separate project identification and separate funding. ITS infrastructure refers to the hardware and software that connect ITS data that are collected by other ITS components. Many of these ITS infrastructure projects have historically been implemented with federal and state funding. Showcase is the premier example, with millions in federal and state funding over the past ten years.

It may be appropriate for Caltrans to take the lead in developing interregional ITS systems. This role is well within Caltrans responsibilities for interregional transportation. While Caltrans has not formally assumed this role, the statewide development of the TMC system, discussed in sub-finding 3.2, provides one

approach to interregional ITS connectivity. This issue may currently be clarified in the statewide Transportation Management System Plan or, in a statewide ITS plan, discussed in sub-finding 3.1.

2.2 The changes in the flow of transportation funding within California has limited the influence Caltrans Headquarters can exert on regional agencies with regard to ITS planning and deployment. The local Caltrans district offices have a much greater role in regional ITS deployment.

In order for projects to qualify for funding through the State Transportation Improvement Program (STIP), the projects must be consistent with adopted Regional Transportation Plans (RTPs). Regional transportation planning agencies (RTPAs) are responsible for the preparation of RTPs.

To reflect changes in both the federal legislation (TEA-21) and in California's transportation planning as a result of Senate Bill 45 (Chapter 622 Statues 1977), the California Transportation Commission (CTC) issued revised guidelines for the development of RTPs in January 2000. These revised guidelines explicitly noted that projects with ITS components need to be in conformity with the National ITS Architecture, and requested RTPAs to include ITS SDPs/EDPs as supplemental information.

One of the major changes introduced in SB 45 was that 75% of STIP funds were to be allocated to the RTPAs to fund projects that are identified in their RTPs. Essentially, the list of projects advanced by an RTPA through the RTP is the result of a local planning process. ITS projects are funded to the extent that one or more member agencies of an RTPA place a project high enough in their priority list.

"We don't do anything that our member agencies don't want to do." *RTPA staff*

This means that the constituency for Caltrans has expanded beyond the 43 RTPAs, to the 58 counties and the 477 cities, each with a traffic engineer or department of transportation and each with one or more local public safety agencies. Each of these entities responds to its own locally elected board or council, and each of these has its own political process and priorities. Obtaining consensus and funding for regional ITS

projects is sometimes very difficult in the face of local constituent priorities for road capacity, road repair and safety.

Most Caltrans districts are still working through the back-log of regional projects that were identified and in process before the implementation of SB 45. However, in order to influence the RTP process, the district offices will need to become much more of a cooperative partner with local agencies. Sharing of plans and priorities, as well as outreach to local agencies, will be much more important.

This type of partnership with local agencies requires a more collaborative approach than has been the practice by some Caltrans staff in some districts. To the extent possible, Caltrans headquarters, or Caltrans New Tech, could provide guidance to district office staff as to "best practices" for local partnering.

Recommendation

Recommendation 2.2 Caltrans New Tech should monitor successful partnerships between district offices and regional agencies to identify and disseminate lessons learned. Joint funding arrangements and experiences with alternative approaches to leveraging funding for projects of regional importance would be particularly valuable.

It should be noted that RTPA staff did not feel that any changes to the RTP process were needed to assist ITS projects receive their "fair" share of monies. The most frequent response from RTPA staff was that the RTP guidelines already included an ITS section and regional architecture statements, and that was sufficient. They also felt that the approval process for the RTP included sufficient steps and comment, and were not inclined to suggest additional sign-offs.

Caltrans district staff, on the other hand, frequently expressed frustration over their "lack of a vote" in the local RTP process.

2.3 With much of the ITS infrastructure now in place, the focus of ITS planning is shifting in the mature areas to interagency integration. In this shift, identifying and filling local gaps, and configuration management of deployed ITS are now the focus.

As ITS systems are installed and expanded, system managers and engineers face the daunting task of managing complex software development efforts and an expanding infrastructure of

communication systems and field devices. Configuration management is a process developed to control change in complex information technology-based systems.

The Southern Priority Corridor recently completed a configuration management study, and defined the process as:

> "Configuration Management is a process applied over the life cycle of any product that provides visibility and control of a product's functional, performance, and physical attributes. The primary objective is to assure that a product performs as intended and its physical configuration is adequately identified and documented to a level of detail sufficient to repeatedly produce the product and meet anticipated needs for operation, maintenance, repair and replacement."

Configuration management is also an integral component of the MTC's TravInfo project. Note that configuration management issues are arising in those areas of the state with a relatively long history of ITS activities.

Caltrans New Tech could provide support to local agencies as their ITS systems are deployed and mature to the point where configuration management is an issue.

Recommendation

Recommendation 2.3 Caltrans should further develop configuration management skills among its staff so as to be able to provide direct support to districts and regional agencies.

2.4 Another barrier to ITS deployment identified in the interviews was a lack of information about specific costs/benefits of ITS elements. There were two issues:

- **A perceived lack of information and,**
- **That the information provided was too complex for ready use in project evaluation.**

There appears to be a need for proactive outreach to the local Caltrans district office staff to keep them informed of ITS innovations and other research being conducted by Caltrans New Tech. Passively providing ITS information on a website does not appear to be reaching the people who may actually need or use the information.

One Caltrans district staff member commented that he only discovered by chance that a New Tech research project on low-tech devices for tracking buses was being conducted. This was an application of great interest in their area and they had been wrestling with the costs associated with GPS/Automated Vehicle Locator (AVL) systems in the context of their ITS plan.

Recommendation *Recommendation 2.4.1 Caltrans should explore proactive methods of getting ITS information to district staff – either in person, or as an outreach effort that extends further into the district office staffing hierarchy.*

In the internal competition for scarce project funding, Caltrans district staff (from both Planning and Traffic Operations) felt that they were at a disadvantage by not being able to point to specific ITS benefits relative to cost. The engineers and planners did not want or need a theoretical framework or elaborate model for calculating the benefits – they wanted a table of specific factors that they could quickly apply.

Cost/benefit information is becoming more critical to the success of ITS deployment as Caltrans moves closer toward implementing its Transportation System Performance Measures. Many of the proposed measures rely on cost/benefit analyses for decision-making.

There is information about ITS benefits and costs available at both the national level as well as from the University of California at Berkeley through projects funded by New Tech. However, either local district staff did not know how to access this information, or the information that was available was not in the format they needed.

Recommendation *Recommendation 2.4.2 Caltrans New Tech should translate research findings on ITS costs/benefits into simple factors such as vehicle hours of delay or vehicle hours saved for greater ease of use in project evaluation.*

Furthermore, several district staff commented on the lack of research as to which traveler information dissemination strategies (CMSs, HARs, Internet website) would be best for the traveling public in their area. Thus they were reluctant to move forward on any traveler information project because they were unable to prioritize the comments from the proponents and detractors of each strategy.

2.5 Both district and RTPA staff indicated an on-going need for training on ITS technical elements. Rural district and rural RTPA staff suggested that New Tech could assist them by providing staff support with the technical skills to assist with ITS deployment.

The need for ongoing training in ITS was strongly reiterated among district and RTPA staff in the rural areas, as well as by district staff in the larger, but non-urban areas. None of the persons interviewed mentioned classes that are currently being offered through the University of California Berkeley, Institute Transportation Studies, Technology Transfer Program. With support from Caltrans Local Assistance Programs, they are coordinating a series of free technical training classes developed by FHWA/FTA through the National Highway Institute. The classes are typically offered at various Caltrans district offices and are open to Caltrans employees and staff local agencies. However, this study indicated a lack of awareness of these opportunities among field personnel.

Several persons spoke of the need for training as being constant, given staff turnover within both Caltrans and the local stakeholder agencies, and the pace of technological change.

Recommendation *Recommendation 2.5.1 Caltrans staff with technical expertise in ITS should be involved in training programs coordinated by other Caltrans units.*

Rural areas typically have many transportation responsibilities that must be dealt with by very few staff. Staff from both Caltrans district offices and rural RTPAs suggested that New Tech could assist them in implementing ITS by providing direct staff support in terms of personnel with the technical skills to monitor the design and installation of ITS projects or elements.

Recommendation *Recommendation 2.5.2 Caltrans should provide technical and staff support to rural RTPAs and district offices for ITS deployment.*

2.6 Some district and RTPA staff commented that a key method of supporting the incorporation of ITS elements into Caltrans construction projects would be to include ITS in Caltrans highway construction standards.

Operations staff in several districts suggested that Caltrans could assist in the mainstreaming and deployment of ITS by incorporating specific ITS standards and requirements in the highway construction standards.

> "ITS components such as vehicle detection and ramp metering should simply be a standard component of all highway construction projects, just like lane markers."
> *Caltrans district staff*

District staff also suggested that Caltrans should explicitly recognize and include in the standard the need to maintain and replace ITS components on a shorter cycle than roadway components. This need for faster replacement of ITS hardware and software was mentioned by several of both the RTPA and district staff.

District planning staff also felt that inclusion of ITS in the standards would give them the authority to ask about ITS in project development.

> "On what basis can a Caltrans district planner say that an ITS solution should be considered in a project?"
> *Caltrans district staff*

There was support for the concept of standards among some RTPA staff as well. RTPA staff were especially concerned that the standards include requirements for fiber optic cabling or conduit in all highway projects.

Support for standards was not uniform, however. One RTPA staff, when asked about this suggestion, replied that if Caltrans were to adopt standards for inclusion of ITS into all projects, Caltrans would either need to provide funding for any mandated extra costs, or would have to couch the standards in terms of "best practices" to permit regional discretion in funding ITS components.

Recommendation

Recommendation 2.6 Caltrans New Tech and Traffic Operations staff should work with staff from the Divisions of Design, Engineering Services and Construction to study the feasibility of including ITS in the highway construction standards. This study should also include opportunities for RTPAs to review and comment on any proposed changes

3. ITS is reasonably well-connected at the local levels within California. Most Caltrans district offices provide within-district area connectivity through the Transportation Management Centers (TMCs), and regional planning agencies provide within-county connectivity. Caltrans should focus its ITS planning efforts on interregional connectivity.

> "Once the RTPA adopts the plan, the real interconnectivity conversations take place at a lower level, among the cities and counties" *RTPA staff*

Within any given Caltrans district area, there are many local ITS elements in operation. These locally built and maintained ITS range from signal synchronization systems on major arterials, to transit locator systems, to all forms of traffic detection devices. Not all of these local systems are connected to any county-wide, region-wide or Caltrans district-wide hub. For example:

- The traveler information system in Orange County, TravelTIP, is not connected to Showcase;
- The Los Angeles County Public Works traffic signal synchronization projects are not linked to Caltrans District 7;
- District 10 staff commented that they have to use the telephone to call the local Public Works staff to change the signal timing on arterials in order to clear traffic off a state highway.

There are two related issues. The first that local agencies do not feel that all ITS elements need to be exchanged. There are no guidelines as to which ITS should be linked first, nor a statewide policy on linking or sharing ITS data. The second issue is control – many local agencies do not want to relinquish control of signals or other traffic control systems to larger regional entities. Between these two issues, there is a great deal of variation regarding what ITS are connected locally.

With the wealth of ITS data that is being collected, the major questions that emerge from these interviews are:

- Which data should be exchanged?
- Exchanged at what levels—within a county, with the local Caltrans district? Across county and/or Caltrans district boundaries?
- How should this data be exchanged?

The issue of what data could and should be exchanged on a statewide basis is one for a statewide ITS plan.

Interconnectivity is the subject of a LACMTA study begun in 2002. The project, referred to as the Regional Integration of ITS projects (RIITS), is beginning with an evaluation of both the current readiness of agencies to share their data sources and the interest of agencies in receiving data from other agencies to enhance their operations. The ports, airport and transit agencies are a principle focus but outreach is also extending to the emergency service agencies such as fire, law enforcement, coroner, CHP and others to evaluate their ability to use various types of ITS data streams. The project will investigate the necessary interface and communication requirements and, working with a selection of the "most ready" agencies, will seek to create working examples of information exchange. These examples will then be used to broaden the stakeholder group and a configuration management element will be put in place to manage the addition of later partners.

3.1 Many district and RTPA staff felt that Caltrans should develop a statewide ITS strategic deployment plan to guide interregional connectivity. However, there was little support for a statewide architecture.

There was strong support for the development of a statewide ITS plan. District staff especially felt that this statewide plan should include a clear and consistent strategy for ITS system operations and maintenance, both for the ITS elements operated by Caltrans on the highway system, and for the interregional ITS projects.

RTPA staff commented on the need for a consistent state-wide view within Caltrans on ITS. Some RTPA staff pointed out that Caltrans had funded a statewide architecture developed by the California Alliance for Advanced Transportation Systems (CAATS) that focused on integration of the statewide Advanced Traveler Information System (ATIS). This plan was prepared

with extensive input and involvement of RTPAs and local agencies, but never received the endorsement of Caltrans. These RTPA staff questioned asked whether Caltrans needed to duplicate CAATS' efforts, or whether the CAATS report should simply be adopted.

A statewide ITS strategic plan could assist the implementation of ITS by addressing the issues of interregional connectivity, the role of Caltrans in the local configuration management process, and by providing clear guidelines as to the priority of information exchanges and identifying the limits of state intervention.

However, there was little support for a statewide architecture except in rural areas.

> "A great idea that would have been good earlier. Now there has been so much effort put into regional architecture plans that a statewide architecture would have to simply mirror each region." *Caltrans district staff*

> "Any statewide architecture will have to look like Showcase. We've put $60 million in it and it isn't going to change." *Caltrans district staff*

RTPA staff from larger areas were more supportive of a statewide ITS plan to lead interregional integration than a statewide architecture. One RTPA senior staff commented that if Caltrans were to require conformity with a statewide architecture, the RTPA would expect Caltrans to provide the funding for regions to implement any needed ITS integration. Otherwise, the statewide architecture would constitute an "unfunded mandate."

District staff, especially those from more rural areas, were more supportive of the concept of a statewide architecture. Several district staff also commented that the state essentially has a statewide architecture in the TMS Master Plan, the planned interconnectivity of the TMCs, and the planned implementation of standard ATMS software in all district offices.

Recommendation

Recommendation 3.1. Caltrans New Tech staff should provide input to the development of a statewide ITS Strategic Deployment Plan to ensure that a statewide plan supplements and supports the efforts of the regional SDPs.

3.2 Caltrans districts that are within the same TMC region appear to be well connected. There are gaps between adjacent districts that are in different TMC regions; the statewide Transportation Management System (TMS) Master Plan may be addressing these gaps. However, there does not appear to be significant coordination between the statewide TMS Master Plan and the regional ITS SDPs.

The 1997 TMC Master Plan identified three Regional TMCs that would serve as the "hubs" for other districts within their region.

- District 4 (Oakland) was to serve as the hub for the Coastal Region, which included Districts 1 (Eureka) and 5 (San Luis Obispo);
- District 3 (Sacramento) was to serve as the hub for the Valley region, which included Districts 2 (Redding), 6 (Fresno), 10 (Stockton) and a District 3 satellite in Kingvale; and,
- District 7 (Los Angeles) was to serve as the hub for the Southern Region, which included District 8 (San Bernardino), 9 (Bishop), 11 (San Diego) and 12 (Orange County).

Caltrans district staff indicated they were almost completely connected with the other districts in their TMC region. In Southern California, the inter-district connectivity is enhanced by the Showcase Priority Corridor network, which connects districts 7, 8 11, and 12.

However, connections with adjacent districts that are not part of the TMC region are scarce to non-existent. For example, District 7 (Los Angeles) is not directly connected with District 6 (Fresno) even though District 6 includes Kern County that is adjacent to the northern portion of Los Angeles County via I-5. Similarly, District 7 is not directly connected with District 5 (San Luis Obispo), even though District 5 includes Santa Barbara County, which is adjacent to Ventura County (which is part of District 7).

The 1997 TMC Master Plan called for the three Regional TMCs to be linked to each other, and to a statewide management center in Caltrans headquarters. At one level, then, all district offices could be considered to be connected to each other through the Regional TMC links.

The Legislative Analysts' Office (LAO), in their 2001-2002 budget analysis, recommended that Caltrans update its TMC Master Plan to develop consistent statewide goals and responsibilities.

This activity is currently underway as the Transportation Management System (TMS) Master Plan. It is possible that this update may fully address the ITS interconnectivity gaps noted.

> "TMCs are the foundation of all Intelligent Transportation Systems (ITS) activities and together, are an integral part of the National ITS Architecture." *TMC Master Plan, 1997*

Several district office staff commented that the major effort currently underway inside Caltrans to update the TMS Master Plan appears to be proceeding without regards for the regional ITS planning efforts reflected in the ITS SDPs. It is difficult to support TMCs as being an integral part of the state's response to the National ITS Architecture if the TMS Master Planning process does not involve the regional ITS SDPs.

> "I haven't seen much evidence that the TMC group knows anything about all of our ITS plans." *RTPA staff*

This is an area in which Caltrans New Tech should be serving as advocates for the SDPs within the various units of Caltrans headquarters.

Recommendation

Recommendation 3.2 Caltrans New Tech staff should be the liaison between the ITS Strategic Deployment Plan areas and the Caltrans Transportation Management System (TMS) Master Plan effort.

3.3 Several persons suggested that there was a need for a single focal point for coordinating and consolidating California's input regarding ITS into the federal transportation reauthorization legislation.

The current federal transportation legislation, TEA-21, expires in September 2003. The initial congressional hearings on the reauthorization were to start this year, but will probably be in full swing in January 2003. Several persons interviewed suggested that California could have a stronger impact on the legislation if there was a single point to coordinate and consolidate input, and that this was a role that New Tech could either assume or facilitate.

Also at the federal level, the USDOT is working toward the development and eventual adoption of ITS standards. There are over 80 ITS standards currently in varying stages of testing, although to date no standards have been adopted. As standards move through the process, there is a need for consolidated and

coordinated comment from California. This is role for which Caltrans New Tech is well suited.

Recommendation *Recommendation 3.3 Caltrans New Tech should coordinate and consolidate California's response to national and federal ITS initiatives, such as ITS standards development, and input regarding ITS issues in the federal transportation reauthorization legislation (TEA-3).*

CONSULTANT RECOMMENDATIONS

During the course of this study, the consultant team identified several recommendations that arose out of the team's wider discussions and observation rather than emerging during the field interviews. These recommendations are presented for Caltrans' consideration in this section.

Recommendation *4.1 Develop systems engineering skills among staff so as to be better able to support the district offices and regional planning agencies in project design.*

FHWA's final Rule and Policy for applying the National ITS architecture requires that all ITS projects be developed using systems engineering approach. This approach:

> "..requires the project team to consider all phases of a system's lifecycle from the moment of the system's conception to its installation. This means taking into consideration the stages of planning, design, procurement, deployment, operations, maintenance, expansion, and retirement of the system or subsystems."
>
> *USDOT FHWA's Final Rule and FTA's Policy for Applying the National ITS Architecture at the Regional Level*

FHWA is planning to offer training courses on system engineering. The consultant team recommends that systems engineering skills and expertise be developed among Caltrans staff so that they will be in a position to support the district offices and regional planning agencies in ITS project design.

Recommendation *4.2 Review the Caltrans project development process to ensure the process is aligned with the systems engineering approach.*

Caltrans has evolved a project development process that meets both federal and state guidelines. This process, though, may not necessarily be aligned with the current federal guidelines that call for a systems engineering approach to project design.

Caltrans should undertake a thorough review of its project development process to align the process with the systems engineering approach.

Recommendation *4.3 Conduct a study of the issues and processes surrounding the maintenance, operations and replacement of ITS components, and provide recommendations for streamlining, simplifying and supporting the administrative processes.*

ITS uses electronic technology that requires a different type of maintenance effort, and a more frequent replacement cycle, than roadways. A common scenario is for ITS elements to be built by a contractor, and then Caltrans is expected to maintain it without proper training or buy-in from the Maintenance staff. Reality is that the supervisor who schedules maintenance may not put something that he and his staff don't know how to do very well at the top of the list, so ITS equipment maintenance may or not be performed as frequently as needed. Similarly, when the ITS equipment needs to be replaced, the costs are expected to come out of the general maintenance pool—and the temptation is for expensive ITS equipment to fall to the bottom of the list. After a few such experiences, the Maintenance and Operations staff are frustrated and understandably negative toward ITS.

According to one district staff member, Caltrans is aware of this issue, and has been trying to provide more training to district maintenance personnel. There also is a statewide contract for maintenance of fiber optic systems that districts can participate in until their local staff is sufficiently experienced. This type of statewide contracting mechanism could serve as a model for specific ITS technical assistance.

A few Caltrans district staff commented that it was difficult to obtain funding for replacement of ITS electronics in part because the Caltrans Maintenance budget forms did not include a separate line item for ITS equipment.

These findings taken together point to the need for a review of the issues and processes surrounding the maintenance, operations and replacement of ITS components. Such a review should focus on providing recommendations for streamlining, simplifying and supporting the administrative processes.

Recommendation *4.4 Work with FHWA to clarify the roles and responsibilities of Caltrans and FHWA with regard to ITS planning at the local level.*

With regional architectures being the responsibility of the MPOs, the respective roles of Caltrans and FHWA in working with and providing guidance to the MPOs have become less clear.

Agreements or understandings as the roles to be taken by each agency with respect to local ITS planning and project development would be useful.

Recommendation

4.5 Establish and coordinate a statewide committee to create a Commercial Vehicle Operations (CVO) ITS partnership in support of information exchange regarding technology and security issues at borders and ports of entry statewide and across states. Caltrans New Tech could lend staffing support and leadership in forging consensus on CVO ITS architecture issues.

It was noted through discussion with Caltrans staff that Commercial Vehicle Operations (CVO) because of their nature are not confined to a particular region. This means that architectural issues associated with interoperability of CVO and interagency exchange of CVO data must be viewed at the statewide, national and even international level.

Several of the larger MPOs have attempted to focus attention on regional CVO issues. For example, the Southern California Priority Corridor has struggled to develop a CVO component for an ATIS system but has failed to find a satisfactory business model.

Caltrans New Tech has undertaken several CVO ITS initiatives, but these do not appear to have addressed information exchange regarding technology and security issues at borders and ports of entry statewide and across states. From comments about the need for wider review of standards and consideration of interoperability issues it is clear that CVO architecture is an issue in need of consistent state support, to facilitate dialogue amongst the many stakeholders from both public and private agencies.

APPENDIX A: INTERVIEWS

Exhibit A-1 on the following pages presents the interview guide used in the interviews with Caltrans district staff and RTPA staff regarding their EDP/SDP.

Exhibit A-2 presents the persons interviewed, by name and affiliation, for each EDP/SDP planning area.

Exhibit A-1: Interview Guide

The primary purpose of this meeting/interview is to discuss the status of the ITS Strategic Deployment Plan and ITS projects in your region, in light of the recent federal regulations regarding the national ITS architecture. The findings will be compiled into a statewide report, in which all respondents will be kept anonymous. The report will be delivered directly to the New Technology Project Manager, Cathy Felkins.

REGIONAL ARCHITECTURE/PLAN

1. What is your perception as to where your region is with respect to the eight points regarding regional ITS architecture in the federal guidelines?

   [Show federal rule 940.9 on Regional ITS Architecture-talk about each of the eight points- send rule in advance, see last page of this document]

2. Where are you with the actual deployment of ITS projects identified in your plan?

3. We'd be interested in hearing about any specific ITS projects that demonstrate a "successful" deployment/implementation in your area/jurisdiction. [Ask for documents/reports that point to this project implementation, operation and maintenance]

4. There may have projects that were less successful. If so, what were some of the barriers you encountered to successfully getting those projects implemented? (e.g. difficulties in getting projects funded?)

5. How does your region address the operations and maintenance of ITS systems?

6. How does your regional/plan area address the issue of connectivity with adjacent plan areas or regions?

7. Is there anything else or more that needs to be done with your region's existing plan? Are there any plans to update the SDP or EDP?

INVOLVEMENT OF STAKEHOLDER GROUPS

8. In practice, how have your existing stakeholder groups functioned? Which stakeholders have been actively involved in promoting and supporting ITS? Have there been changes of emphasis in terms of involvement by various agencies, additions/drop-outs among those active in ITS?

9. Is the formal/institutional structure organized to implement the SDP as a regional plan, or it organized around a specific project or set of projects?

10. We would be interested in hearing about any effective partnerships that have assisted in implementing ITS in your region, particularly in any lessons learned.

ITS IN RTP PROCESS [asked of MPO related entities only]

11. Does your RTP include a statement regarding acceptance of a regional architecture?

12. Are there policies or guidelines in the current RTP process that should be changed or amended in order for ITS projects to receive it's 'fair share" of regional transportation funding?

INTEROPERABILITY [Asked of Caltrans District Office staff only]

13. How has your district addressed the potential for interoperability between adjacent District Offices?

ROLE OF CALTRANS

14. How could Caltrans Division of New Technologies and Research assist you? Is there any technical assistance that New Tech could provide with regard to ITS?

15. Would it assist you if there were a statewide architecture? How would such an architecture look to you?

OTHER ISSUES

16. Are there other issues related to ITS regional architectures that we haven't discussed but should?

Exhibit A-2: Individuals Interviewed

CALTRANS DISTRICT OFFICE STAFF	District 1:	Michelle Fell Mart Van Zandt
	District 2:	Russ Wenham
	District 3:	Scott Forsythe Jeff Pulverman
	District 4:	Erik Alm, Planning Judy Chen, Chief, Traffic Systems Alan Chow, Traffic Systems Hector Garcia, AMTS Development
	District 5:	Scott Eades Terry Hobson Rich Krumholtz, Planning Paul McClintic Steve Price, Deputy Division Chief, Traffic Operations Shayne Sandeman, Planning
	District 6:	Andy Kubik, Planning Sergio Venegas, Traffic Electrical Systems Development
	District 7:	Pat Perovich
	District 8:	Tom Ainsworth, Operations Diana Barich, Operations William Mosby, Planning
	District 9:	Christian Bushong, ITS Liaison Brad Mettam
	District 10:	Jane Wegge-Perez, Planning Annette Clark, Planning Barney Bender, Traffic Operations
	District 11:	Ross Cather, Traffic Studies Special Branch
	District 12:	Ed Khosravi

REGIONAL TRANSPORTATION PLANNING AGENCY STAFF

Association of Monterey Bay Area Governments
Dean Munn
Butte County Association of Governments:
Ivan Garcia, Senior Planner
Del Norte County Transportation Commission:
Susan Morrison
El Dorado County Transportation Commission:
Carole Glatselter
Fresno Council of Governments
Tony Boren, Senior Transportation Planner
Jennifer Dansby, Planning Coordinator
Humbolt County Association of Governments:
Spencer Clifton
Imperial County:
Tim Jones, Imperial County Public Works Dept.
Lassen County:
Dan Newton
Los Angeles County Metropolitan Transportation Authority:
Peter Liu
Robert Yates
Los Angeles County:
Jane White, Los Angles County Dept. of Public Works
Kern Council of Governments:
Ron Brumett, Director
Mendocino County Council of Governments:
Phil Dow (also representing Lake County)
Metropolitan Transportation Commission:
Joel Markowitz, Manager Advanced Systems Applications
Janie Page
Modoc County Transportation Commission:
Pam Couch
Nevada County Transportation Commission:
Mike Woodman
Orange County Transportation Authority:
Dean Delgado
Placer County Transportation Planning Agency:
Kathy Matthews
Plumas County Transportation Commission:
Martin Byrne
Riverside County Transportation Commission
Marilyn Williams
Sacramento Area Council of Governments:
David Shabazian
Pete Hathaway

San Bernardino Association of Governments
Michelle Kirkoff
San Diego Association of Governments
John Duve, Advanced Transportation Systems
San Joaquin Council of Governments
Mike Swearingen
Santa Barbara Metropolitan Transit District
Jerry Estrada
Sierra Local Transportation Commission:
Brenda Mitchell
Stanislaus Council of Governments
Debbie Whitmore
Southern California Association of Governments:
Robert Huddy, Senior Transportation Planner
Tahoe Regional Planning Agency
Nick Haven
Tehama County:
Tim Bollman, Tehama County Public Works
Ventura County Transportation Commission
Ginger Gherardi, Executive Director

FEDERAL HIGHWAYS ADMINISTRATION STAFF

Frank Cechini
Gloria Stoppenhagen

CALTRANS NEW TECH STAFF

Coco Briseno
Joan Borucki
Cathy Felkins
Susan Harrington
George Hattrup (formerly with New Tech in Orange County)
Judy Semerjian

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